



SPACE SCIENCE CENTER
INSTITUTE OF GEOPHYSICS AND PLANETARY PHYSICS
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ANALYSIS OF GEODETIC SATELLITE TRACKING DATA

NASA Contract No. NSR45-007-060

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1. Analysis of Camera Tracking Data

The analysis of Baker-Nunn camera observations being carried out at USAF Aeronautical Chart & Information Center, St. Louis, Missouri, was completed. For the results to be submitted for publication, 7,234 Baker-Nunn camera observations of five satellites were analyzed to determine simultaneously 44 tesseral harmonic coefficients of the gravitational field, 36 station coordinates and 511 orbital elements. Supplementary observational data incorporated in the solution included accelerations of 24-hour satellites and directions between tracking stations from simultaneous observations; observation equations were also written for the differences between geometrical and gravitational geoid heights at tracking stations. Several variations in relative weighting of different observational data and a priori variances of parameters were tested. The previous independent solution most closely approached was that by Anderle based on Doppler data, from which the rms discrepancy was $\pm 0.8 \times 10^{-6}$ for 38 normalized harmonic coefficients, or ± 7 meters in total geoid height. An equatorial radius of 6378153 ± 8 m. was obtained.

Further analyses are now being carried out holding most of the tracking stations fixed and adding 36 more tesseral harmonic coefficients to those being determined: indices 4m 54, 55, 66, 71 thru 75, 83 thru 86, 91, 92, 99, 101, 102, 111, 121. Of these, only 99 seems to well-determined, because of a near-resonance with satellite 1961 α 61 (MIDAS 4).

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More observations of 1964-1A (70° inclination) and 1963-53A (79° inclination) are being obtained to add to future analyses.

2. Analysis of Doppler Tracking Data

This work is still at the stage of checking the revision of the Data Selection and Conversion programs at UCLA. It is hoped the slow progress is indicative of thoroughness on the part of the programmer.



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